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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/829,141	04/21/2004	James C. Kim	LUM-03-06-06	5434
32566	7590	04/07/2006	EXAMINER	
PATENT LAW GROUP LLP 2635 NORTH FIRST STREET SUITE 223 SAN JOSE, CA 95134			NGUYEN, JOSEPH H	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 04/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/829,141

Applicant(s)

KIM ET AL.

Examiner

Joseph Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 January 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-23 is/are rejected.
- 7) ☒ Claim(s) 6 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Claim Objections*

Claim 1 is objected to because of the following informalities:

In claim 1, line 3, the word "wurtzite" should be corrected to read, "wurtzite crystal structure".

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 15, 18-19 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hata et al. (US 2003/0057434 A1) in view of Sun et al. ("Polarization anisotropy of the photoluminescence of M-plane).

Regarding claim 1, Hata et al. disclose in figure 4 a semiconductor light emitting device comprising a light emitting layer 5A (para [0079], line 2) disposed between an n type region 4 (para [0078], line 8) and a p type region 6 (para [0080], line 2) wherein the light emitting layer is wurzite (para [0119]) and the light emitting layer has a thickness greater than 25A (para [009]). Note that the device-constituting layer comprising the light-emitting layer is a wurzite structure, and therefore the light-emitting layer is also wurzite. Hata et al. does not disclose a <0001> axis being substantially parallel to a top surface

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of the light-emitting layer. Applicant teaches in para [0011] the light emitting layer that has a top surface substantially parallel to  $\langle 0001 \rangle$  axis is  $\langle 1120 \rangle$  layer. Sun et al. teaches in page 3850, right column, lines 9-17 the light emitting layer is  $\langle 1120 \rangle$  layer. Therefore, Sun et al. discloses a  $\langle 0001 \rangle$  axis being substantially parallel to a top surface of the light-emitting layer. In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hata et al. by having a  $\langle 0001 \rangle$  axis being substantially parallel to a top surface of the light emitting layer to increase the polarization degree in a light emitting layer (page 3850, right column, line 1-2).

Regarding claims 2-4, Hata et al. discloses in para [0079], lines 2-7 the light-emitting layer has a thickness greater than 50A, 90A and 150A. Note that Hata et al. discloses the light emitting layer 5A has a plurality of barrier layers and well layers, each having a thickness of 5nm (50A). Therefore, the total thickness of the light-emitting layer is greater than 50A, 90A and 150A.

Regarding claim 5, Sun et al. discloses the light-emitting layer comprises  $\langle 1120 \rangle$ .

Regarding claim 15, Hata et al. discloses in para [0079] the light emitting layer 5A is a first quantum well and further comprises a second quantum well and a barrier layer disposed between the first and second quantum well; wherein the first quantum well, second quantum well and barrier form an active region.

Regarding claim 18, Hata et al. discloses in figure 4 the active region 5A is disposed between first and second cladding layers 4, 6.

Regarding claim 19, it is inherent the bandgap of the first and second cladding layers is larger than that of the first and second quantum wells so that holes and electrons can recombine in the active region and emit light.

Regarding claims 22-23, the light emitting device of Hata et al. and Sun et al. comprise a similar structure as that of the claimed light emitting device and therefore is capable of performing as claimed.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hata et al. and Sun et al., and further in view of Goetz et al. (US 2002/0171092 A1).

Regarding claim 7, Hata et al. and Sun et al. disclose the light emitting layer 5A comprising GaInN (para [0079], lines 2-7), not AlInGaN as claimed. However, Goetz et al. discloses the light-emitting layer can be formed of GaInN or AlInGaN (para [0022], lines 3-6). In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hata et al. and Sun et al. by having the light emitting layer comprising AlInGaN because GaInN and AlInGaN are recognized in the art as equivalents.

Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hata et al. and Sun et al., and further in view of Ibbetson et al. (US 6,515,313).

Regarding claim 8, Hata et al. and Sun et al. disclose substantially all the structure set forth in the claimed invention except the light emitting layer being graded from a first indium composition in a first portion of the light emitting layer proximate the n

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type region to a second indium composition in a second portion of the light emitting layer proximate the p type region. However, Ibbetson et al. discloses in (col. 10, lines 31-43) the light emitting layer being graded from a first indium composition in a first portion of the light emitting layer proximate the n type region to a second indium composition in a second portion of the light emitting layer proximate the p type region. In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hata et al. and Sun et al. by having the light emitting layer being graded from a first indium composition in a first portion of the light emitting layer proximate the n type region to a second indium composition in a second portion of the light emitting layer proximate the p type region to increase emission efficiency (col. 10, line 45).

Regarding claims 9-10, It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify Hata et al. and Sun et al. and Ibbetson et al. by having the first composition greater (claim 9) or less (claim 10) than the second composition, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 11-14 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hata et al. and Sun et al., and further in view of Bour et al.

Regarding claims 11 and 12, Hata et al. and Sun et al. disclose substantially all the structure set forth in the claimed invention except the light emitting layer being

graded from a first aluminum composition in a first portion of the light emitting layer proximate the n type region to a second aluminum composition in a second portion of the light emitting layer proximate the p type region. However, Bour et al. discloses in para [0046] the light emitting layer being graded from a first aluminum composition in a first portion of the light emitting layer proximate the n type region to a second aluminum composition in a second portion of the light emitting layer proximate the p type region. In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hata et al. and Sun et al. by having the light emitting layer being graded from a first aluminum composition in a first portion of the light emitting layer proximate the n type region to a second aluminum composition in a second portion of the light emitting layer proximate the p type region to improve the light output of the active region in light emitting device (para [0001], Bour et al.).

Regarding claims 13-14, It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify Hata et al. and Sun et al. by having the first composition greater (claim 13) or less (claim 14) than the second composition, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 16, Hata et al. and Sun et al. disclose substantially all the structure set forth in the claimed invention except an indium composition in one of the first and second quantum wells being graded. However, Bour et al. discloses in para [0027] an indium composition in one of the first and second quantum wells being

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graded. In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hata et al. and Sun et al. by having an indium composition in one of the first and second quantum wells being graded to improve the light output of the active region in light emitting device (para [0001], Bour et al.).

Regarding claim 17, Bour et al. discloses in para [0011] the barrier layer has a graded composition.

#### ***Allowable Subject Matter***

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The reference (s) of record do not teach or suggest, either singularly or in combination at least the limitation of "the light emitting layer comprises {101'0}" for claim 6.

#### ***Response to Arguments***

Applicant's arguments filed on 01/12/2006 have been fully considered but they are not persuasive.

With respect to claim 1, applicant argues there is no explanation why increasing "the polarization degree in the light emitting layer" motivates a person of skill in the art to



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combine Hata et al. with Sun et al. However, it is well known in the art increasing the polarization degree in the light emitting layer would obtain excellent brightness (See col. 9, lines 10-12 of Kaneko US 6,504,588 provided herein as evidence only). Also, Sun et al. teaches in the left column of page 3850 growing the III-nitride layer substantially parallel to  $\langle 0001 \rangle$  axis would result in improved lasing performance. As such, there is a motivation to combine Hata et al. and Sun et al. Further, applicant argues growth of some of the layers in Hata et al's device along Sun et al's uncommon growth direction may result in a device with more defects. However, this is a mere allegation unsupported by evidence. Unless applicant can provide evidence to support this conclusion, the combination of Hata et al. and Sun et al. results in a better performing light emitting device as stated above. Lastly, applicant argues any III-nitride layer grown over Hata et al's non-single crystalline layer would revert to growing along the c-axis and would not grow as Sun et al's structure which is grown along an axis perpendicular to the c-axis, and thus the combination of Hata et al. and Sun et al. cannot be successful. However, this is again a mere allegation and speculation unsupported by evidence. Therefore, the combination of Hata et al. and Sun et al. still reads on claim 1. Accordingly, the rejection of claims 1-23 still stands.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

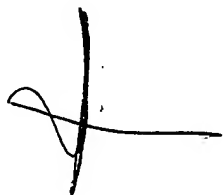
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Nguyen whose telephone number is (571) 272-1734. The examiner can normally be reached on Monday-Friday, 7:30 am- 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300 for regular communications.



SPE Kenneth Parker  
T22800

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JN

March 31, 2006.